



1) AP 103D-0304-1

1st Issue Mar. 73

~~INAP-CR20201-2~~

2) INAP103D-CR20201-2

6) INAP103D-CR20201-6

# **GAS TURBINE STARTER/ AUXILIARY POWER UNIT LUCAS AEROSPACE TYPE CR201-Mk 2 AND TYPE CR 202**

|     |                  |
|-----|------------------|
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ALONS

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Prepared by LUCAS AEROSPACE LTD. HEMEL HEMPSTEAD.

Publications authority : ATP / MOD (PE)

Service users should send their comments through  
the channel prescribed for the purpose in ;

Naval Aircraft Maintenance Manual (RN)



## AMENDMENT RECORD

[illegible]

| Amdt | Incorporated By | Date |
|------|-----------------|------|
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**RECORD OF ADVANCE INFORMATION LEAFLETS (AIL)**

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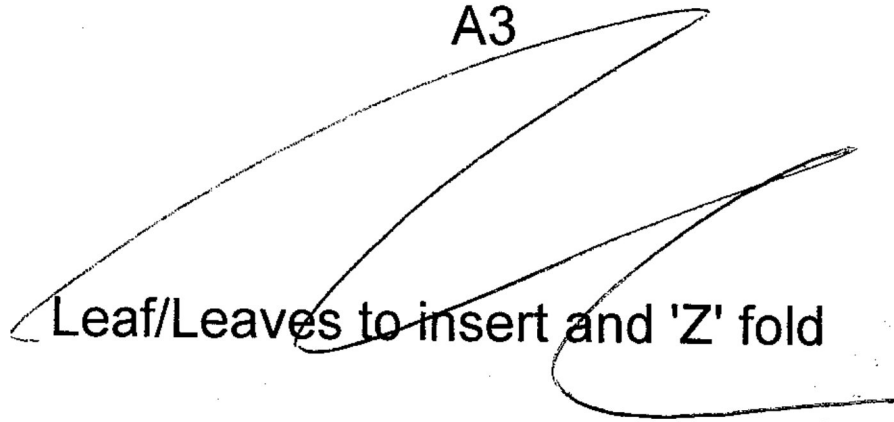
**RECORD OF SERVICE TEMPORARY AMENDMENT LEAFLETS (STAL)**

| Identity * | Date Received | Deleted by Amdt or AIL or STAL |
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\* Insert specific identity of STAL

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Colour

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General information  
► Warnings

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- 2 Servicing
- 3 Testing
- 4 Fault diagnosis and rectification

NOTE TO READERS:-

Changes are indicated by filled triangles in the immediate vicinity of the change.

## MODIFICATION RECORD

AP 103D-0304-1

| Mod No  | Amdt No | Mod No    | Amdt No | Mod No    | Amdt No | Mod No     | Amdt No |
|---------|---------|-----------|---------|-----------|---------|------------|---------|
| GT21595 | -       | GT7416    | -       | GT22086   | -       | LM60035    | -       |
| GT21598 | -       | Rev 1     | -       | GT22089   | -       | LM3003     | -       |
| GT21599 | -       | GT7424    | -       | GT22094   | -       | LM3004(RS) | -       |
| GT21600 | -       | GT7426    | -       | GT22097   | -       | LM60040    | -       |
| GT21602 | -       | GT7453    | -       | GT7609    | -       | LM60049    | -       |
| GT21603 | -       | GT7463    | -       | GT7636    | -       | LM60048    | -       |
| GT21604 | -       | GT7467    | -       | GT7669(0) | -       | LM3019(RS) | -       |
| GT21625 | -       | GT21807   | -       | GT22148   | -       | LM60056    | -       |
| GT21626 | -       | GT21808   | -       | GT22095   | -       | LM60061    | -       |
| GT21628 | -       | GT21814   | -       | GT22193   | -       | LM60070    | -       |
| GT21630 | -       | GT7429    | -       | GT22194   | -       | LM60052    | -       |
| GT21632 | -       | GT7495    | -       | GT22195   | -       | LM60077    | -       |
| GT21635 | -       | GT7528    | -       | GT22196   | -       | GT7702     | -       |
| GT21636 | -       | GT7530(0) | -       | GT22197   | -       | LM60084    | -       |
| GT21637 | -       | GT7542(0) | -       | GT22198   | -       | LM60083    | -       |
| GT21638 | -       | GT7560    | -       | GT22199   | -       | LM3026(0)  | -       |
| GT21682 | -       | GT21858   | -       | GT22200   | -       | LM3033(0)  | -       |
| GT21685 | -       | GT21860   | -       | GT7595    | -       | LM60087    | -       |
| GT21686 | -       | GT21861   | -       | GT22234   | -       | LM60095    | -       |
| GT21687 | -       | GT21863   | -       | GT7679    | -       | LM60094    | -       |
| GT21688 | -       | GT21868   | -       | GT22264   | -       | LM3048     | -       |
| GT21689 | -       | GT21869   | -       | GT22265   | -       | LM60102    | -       |
| GT21695 | -       | GT21953   | -       | GT22266   | -       | LM3036     | -       |
| GT21701 | -       | GT21955   | -       | GT22267   | -       | LM3040(RS) | -       |
| GT21703 | -       | GT21867   | -       | GT22268   | -       | LM60107    | -       |
| GT21778 | -       | GT21870   | -       | GT22269   | -       | LM60112    | -       |
| GT21789 | -       | GT7485    | -       | GT22271   | -       | LM3063     | -       |
| GT21793 | -       | GT7486    | -       | GT22272   | -       | LM60120    | -       |
| GT71319 | -       | GT7524    | -       | GT22273   | -       | LM60121    | -       |
| GT7331  | -       | GT7529    | -       | GT22232   | -       | LM60123    | -       |
| GT7359  | -       | GT21958   | -       | GT22320   | -       | LM60124    | -       |
| GT7363  | -       | GT21959   | -       | GT22322   | -       | LM3044     | -       |
| GT7372  | -       | GT7558(0) | -       | GT7687    | -       | LM60126    | -       |
| GT7373  | -       | GT7533    | -       | GT7702    | -       | LM3061     | -       |
| GT7376  | -       | Rev 1     | -       | GT7701(0) | -       | LM60141    | -       |
| GT7377  | -       | GT7570    | -       | GT22352   | -       | LM60139    | -       |
| GT7384  | -       | GT7591(0) | -       | GT22351   | -       | LM60152    | -       |
| GT7422  | -       | GT21965   | -       | GT22350   | -       | LM60136    | -       |
| GT7333  | -       | GT21964   | -       | GT7765    | -       | LM60165    | -       |
| GT7345  | -       | GT7579(0) | -       | LM60005   | -       | LM3034     | -       |
| GT7352  | -       | GT7593    | -       | GT7720(0) | -       | LM3079     | -       |
| GT7365  | -       | GT21972   | -       | LM3007    | -       | LM3070     | -       |
| GT7397  | -       | GT22081   | -       | GT22187   | -       | LM60184    | -       |
| GT7402  | -       | GT7601(0) | -       | GT22100   | -       | LM60181    | -       |
| GT7410  | -       | GT22084   | -       | LM60026   | -       | LM60211    | -       |
| GT7413  | -       | GT7596    | -       | LM60023   | -       | LM60187    | -       |
| GT7415  | -       | GT7561    | -       | LM60022   | -       | LM60267    | -       |

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 NA Mod not applicable to this publication  
 C Mod cancelled  
 AS Amendment sheet



## MODIFICATION RECORD

| Mod No  | Amdt No | Mod No    | Amdt No | Mod No  | Amdt No | Mod No   | Amdt No |
|---------|---------|-----------|---------|---------|---------|----------|---------|
| LM60275 | -       | LM60406   | -       | LM60520 | -       | MA11644  | NA      |
| LM60276 | -       | LM3127    | -       | LM3162  | -       | MA11578  | NA      |
| LM60270 | -       | LM60364   | -       | LM3118  | -       | MA11569  | NA      |
| LM60271 | -       | LM60398   | -       | LM60391 | -       | MA11598  | NA      |
| LM60272 | -       | LM60363   | -       | LM60501 | -       | MA11619  | NA      |
| LM60305 | -       | LM60367   | -       | LM60503 | -       | MA11621  | NA      |
| LM60306 | -       | LM60365   | -       | LM60517 | -       | MA11671  | NA      |
| LM60308 | -       | LM60368   | -       | LM60519 | -       | MA11659  | NA      |
| LM60241 | -       | LM60369   | -       | LM60533 | -       | MA11630  | NA      |
| LM60309 | -       | LM60370   | -       | LM3166  | -       | MA11682  | NA      |
| LM60312 | -       | LM60396   | -       | LM60673 | -       | MA11732  | 19      |
| LM60313 | -       | LM60397   | -       | LM60756 | 16      | MA11733  | NA      |
| LM60314 | -       | LM60399   | -       | LM60565 | 16      | MM1694   | NA      |
| LM60315 | -       | LM60400   | -       | LM60560 | 16      | MM1726   | NA      |
| LM60316 | -       | LM60402   | -       | LM60588 | 16      | MM1745   | NA      |
| LM60317 | -       | LM60403   | -       | LM60702 | 16      | MM101178 | 21      |
| LM60318 | -       | LM60404   | -       | LM60700 | 16      | MM101193 | 21      |
| LM60319 | -       | LM60407   | -       | LM60760 | 16      |          |         |
| LM60320 | -       | LM60408   | -       | LM60868 | 16      |          |         |
| LM60321 | -       | LM60409   | -       | LM60869 | 16      |          |         |
| LM60322 | -       | LM60266   | -       | LM60873 | 16      |          |         |
| LM60323 | -       | LM60410   | -       | MA10932 | NA      |          |         |
| LM60324 | -       | LM60345   | -       | MA10852 | NA      |          |         |
| LM60240 | -       | LM3135    | -       | MA10966 | NA      |          |         |
| LM3092  | -       | LM60428   | -       | MA10982 | NA      |          |         |
| LM60397 | -       | LM60439   | -       | MA11012 | NA      |          |         |
| LM60328 | -       | LM3139    | -       | MA10989 | NA      |          |         |
| LM60326 | -       | LM60447   | -       | LM60894 | NA      |          |         |
| LM60325 | -       | LM60454   | -       | MA11260 | 19      |          |         |
| LM3108  | -       | LM60449   | -       | MA11196 | NA      |          |         |
| LM60239 | -       | LM60451   | -       | MA11242 | NA      |          |         |
| LM60343 | -       | LM60441   | -       | MA11290 | NA      |          |         |
| LM3111  | -       | LM60452   | -       | MA11316 | NA      |          |         |
| LM3106  | -       | LM60455   | -       | MA11230 | NA      |          |         |
| LM3081  | -       | LM60456   | -       | MM1277  | 19      |          |         |
| LM3142  | -       | LM60453   | -       | MM1422  | 19      |          |         |
| LM60393 | -       | LM3145    | -       | MA10001 | NA      |          |         |
| LM60237 | -       | LM60475   | -       | Iss 2   |         |          |         |
| LM3131  | -       | LM60476   | -       | MA11496 | NA      |          |         |
| LM60366 | -       | LM60477   | -       | MA11404 | NA      |          |         |
| LM60269 | -       | LM60478   | -       | MA11516 | NA      |          |         |
| LM3119  | -       | LM3081 R1 | -       | MA11518 | NA      |          |         |
| LM3087  | -       | LM60504   | -       | MM1335  | NA      |          |         |
| LM60405 | -       | LM60518   | -       | MA11585 | NA      |          |         |

\* Incorporated in initial issue of publication  
 NA Mod not applicable to this publication  
 C Mod cancelled  
 AS Amendment sheet



## LIST OF MATERIALS

| Nomenclature                          | Ref No               | Specification     | NATO Code |
|---------------------------------------|----------------------|-------------------|-----------|
| <u>ABRASIVES:</u>                     |                      |                   |           |
| Nil                                   |                      |                   |           |
| <u>CLEANING AGENTS:</u>               |                      |                   |           |
| Kerosene (AVTUR)                      | 33A/9431771          | D.Eng.R.D.2494    |           |
| Lotoxane                              | 33D/6850-            |                   |           |
|                                       | 99-192-3265          |                   |           |
| <u>FUELS:-</u>                        |                      |                   |           |
| AVTAG                                 | 34A/9100448          | D.Eng.R.D.2486    |           |
| AVTUR                                 | 34A/9431771          | D.Eng.R.D.2494    |           |
| AVCAT                                 | 0721/2202148<br>(RN) | D.Eng.R.D.2498    |           |
| <u>JOINTING MATERIALS</u>             |                      |                   |           |
| RACHEM THERMOFIT                      |                      | A.F.S.2059 A      |           |
| Type S-10005                          |                      |                   |           |
| LOCTITE-SCREWLOCK                     | 33H/2205239          | D.T.D.900/4588    |           |
| SILICON RUBBER                        |                      | A.F.S.648         |           |
| SEALANT RTV732                        |                      |                   |           |
| ADHESIVE Type MS.2705                 | 33H/2241391          | D.T.D.900V/4608   |           |
| MOLY PAUL-POLY                        |                      | D.T.D.900/4669    |           |
| (anti-sieze paste)                    |                      |                   |           |
| HYLOMAR SQ32M                         | 34B/2202370          | D.T.D.900/4568B   |           |
| <u>OILS AND GREASES:</u>              |                      |                   |           |
| Oil= 7.5 centistokes                  | 34A/9100591          | D.Eng.R.D.2487    | (OX 38)   |
| 5 centistokes                         | 34A/22D1939          | MIL-L-23699       | (OX 27)   |
| Inhibiting                            | 34D/9431324          | D.E.F.2001/A      | (OM 13)   |
| Grease: anti-seize (high temperature) | 34B/2249248          | D.T.D.5617        | (ZX 38)   |
| anti-seize ZX 13                      | 34B/9100528          | D.T.D.392         |           |
| 'O' rings                             |                      | D.T.D.825         |           |
| roller bearings                       |                      | D.T.D. 897A       | (XG315)   |
| Dry lubricant: DAG.717                |                      |                   |           |
| <u>PAINTS, DOPES AND VARNISHES:</u>   |                      |                   |           |
| ALOCROM 1200                          | 33C/2202321          | D.T.D.900V/4413   |           |
| Enamel E.3696 (grey)                  |                      | A.I.D.Ref.No.6123 |           |
| <u>MISCELLANEOUS -</u>                |                      |                   |           |
| Masking tape (2in wide)               | 33B/759              | D.E.F.1314        |           |
| Tie wire 24 s.w.g.                    | 30A/9148334          | D.T.D.189         |           |
| solder BS.219 grade 5S                | 30BP9475574          | D.T.D.599         |           |

## LEADING PARTICULARS

NAME ... .. GAS TURBINE STARTER/AUXILIARY POWER UNIT  
 TYPE ... .. LUCAS CR201 and CR 202

Nominal electrical supply ... .. 24V d.c.

Power output (+ 15 deg.C, sea level) ... Nominal 87 shp (engine starting),  
 6kVA, 3-phase, 200V, 400Hz (A.P.U. mode)

Max. torque (- 26 deg.C, sea level, static) ... .. 310 lbf ft (420 Nm)

Compressor speed ... .. 77,000 rev/min

Compressor pressure ratio (+ 15 deg.C, sea level) ... .. 3.65 : 1

Air mass flow (+ 15 deg.C, sea level) ... .. 1.35 lb/s (0.611 kg/s)

Gear ratio ... .. 19.42 : 1

Cut-off speed at engine drive coupling ... .. 3125 rev/min

Duration of starting cycle (i.e. time to 76,500 rev/min) ... .. 8 seconds

Drive connection ... .. 30 deg. involute splines to BS.3550,  
 23 teeth 10/20 pitch, major dia.  
 2.40 in. (60.96 mm), fillet root  
 side fit.

Mounting: outside dia. of V-clamp flange ... .. 7.2 in. (182.88 mm)

## Dimensions:

Length (overall) ... .. 27.436 in. (696.87 mm)

Length to mounting flange ... .. 18.360 in. (466.34 mm)

Width ... .. 20.000 in. (508.00 mm)

Height ... .. 16.500 in. (419.10 mm)

Weight (with starter motor and a.c. generator) ... 127.51bf (57.833 kgf)

## GENERAL INFORMATION

## BASIC EQUIPMENT

CR201 and CR202 Gas turbine starter/auxiliary power unit (GTS/APU)

## GTS/APU MOUNTED ASSOCIATED EQUIPMENT

| <u>Component</u>                  | <u>Type</u>                     | <u>AP Reference</u> |
|-----------------------------------|---------------------------------|---------------------|
| Electric starter motor            | Lucas C.16503                   | 113E-0532-13A6      |
| 6 kVA, a.c. regulated generator   | Lucas BAF.1201                  | 113B-0138-13A6      |
| ▶ 6 kVA, a.c. regulated generator | Lucas BAF.1203<br>(Mod. LM3092) | 113B-0138-13AA      |

## AIRCRAFT MOUNTED ASSOCIATED EQUIPMENT

|                                        |                                               |                 |
|----------------------------------------|-----------------------------------------------|-----------------|
| HE ignition unit                       | Lucas NB.10802                                | 113L-0124-13A6  |
| Sequence unit                          | Lucas U.16303                                 | 113D-1437-13A6  |
| Monitor unit                           | Smith 0102 KMU-1<br>(Lucas Part No. N.204211) | 113F-0423-13A6  |
| Over voltage/frequency protection unit | Lucas U.3641                                  | 113D-07140-13A6 |
| Contactor                              | Lucas D.23402/1                               | 113D-13102-1    |
| Rotary switch                          | Lucas D-23201                                 | 113D-1125-1     |
| Push-button switch                     | Lucas D.0701                                  | 113D-1123-1     |
| Push-button switch cover               | Lucas ZA.21501                                | -               |
| Fuel drain valve                       | Lucas N.179988/1                              | -               |

## Note ...

Quantities quoted in gal/h are given in Imperial gallons throughout this publication.



# WARNINGS

CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH

MAKE SURE YOU KNOW THE SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS  
BEFORE YOU USE A HAZARDOUS SUBSTANCE

READ THE LABEL ON THE CONTAINER IN WHICH THE SUBSTANCE IS SUPPLIED

READ THE DATA SHEET APPLICABLE TO THE SUBSTANCE

OBEY THE LOCAL ORDERS AND REGULATIONS

## WARNINGS

- ▶ (1) LOTOXANE. LOTOXANE IS USED IN THE MAINTENANCE OF THIS EQUIPMENT.  
REFER TO HAZARDOUS STORES INFORMATION SYSTEM (HSIS). ◀
- ▶ (2) KEROSENE. KEROSENE IS USED IN THE MAINTENANCE OF THIS EQUIPMENT.  
REFER TO HSIS. ◀
- (3) LETHAL VOLTAGE. THE GAS TURBINE STARTER/AUXILIARY POWER UNIT  
CONTAINS POTENTIALLY LETHAL OR DAMAGING VOLTAGES. REFER TO DEF STAN  
61-15.
- ▶ (4) ASBESTOS. THIS EQUIPMENT CONTAINS ASBESTOS MATERIAL AND/OR  
ITEMS. REFER TO HSIS SAFETY DATA SHEET (SDS) 6540, JSP 375 VOL 2,  
AP100B-10, DATA SHEET 0600 AND AP 400A-0004.
- (5) AMORPHOUS SILICIA. HIGHLY TOXIC, IRRITANT STATIC DISCHARGE RISK.  
THE REFRAISIL LAGGING ON THE GTS/APU EXHAUST DUCT CONTAINS  
AMORPHOUS SILICIA. SHOULD THE LAGGING BECOME DAMAGED, AMORPHOUS  
SILICIA IN DUST FORM IS HAZARDOUS TO HEALTH. ◀

